been published recently. In this list citations of specimens are chiefly to the herbarium of the author which has resulted in showing a very limited distribution for a great part of the species. Some descriptive notes are given and occasionally a key to species. Among the latter is one of *Carex* contributed by Mackenzie.

Specific limits are closely drawn and subspecies are numerous. Eight new species and thirty-five subspecies are described. The nomenclature which is based upon absolute priority, is worked out with the assistance of Dr. J. A. Nieuwland, and entails changes in over 230 of the 1,246 names on the list. Fifteen new names are proposed for genera and a considerable synonymy is given.

Changes in names are unpopular with many people and narrow limitation of species yet more. But is not the "splitter" entitled to a certain measure of credit? Not infrequently do some of his discoveries become accepted, even by the conservative. Radical movements have ever resulted in notable advances in some respect. Among cultivated plants we have races of greatly different values which are scarcely separable by the smallest descriptive characters. The describer of new forms has at least brought new facts to attention of others. If variations in plants can be shown to the result of certain conditions, our knowledge has advanced. This seems to be one of the great fields for botanical investigation at the present time.

A first list of fungi[4] of the state has just been completed. This list includes nearly 900 species distributed as follows: Phycomycetes, 22; Ascomycetes, 271; Lower Basidiomycetes, 161; Higher Basidiomycetes, 119; Fungi Imperfecti 119. The completion of this notable contribution is especially fortunate since the author, formerly a physician at Kulm, N. D., is now in the military service. His work is already known through his "Fungi Dakotenses" of which eighteen fascicles of twenty-five numbers each had been issued. In the course of his work many new species have been described, chiefly by Rehm and Saccardo. These are indicated in the list by the designation "n. sp." but no reference is given to place of publication. One new species is described, *Hendersonia Cratægi.*

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[4] Brenckle, J. F., "North Dakota Fungi," *Mycologia,* Vol. 9, pp. 275–293, 1917; Vol. 10, pp. 199–221, 1918.

SPECIAL ARTICLES

PEAR BLIGHT WIND BORNE

WAITE[1] in 1891 proved that bees were able to transmit the bacteria of pear blight from flowers and in this way spread the disease. Of recent years several important papers have appeared which demonstrate clearly that certain other insects can act as carriers or agents of transfer. The number of insects which have now been convicted is quite large. The list includes *Adelphocoris rapidus* Say,[2] *Aphis avenæ* Fab.,[3] *Aphis pomi* De Geer,[4] *Campylomma verbasci* Mey,[2] *Empoasca mali* Le Baron,[3] *Lygus pratensis* Linn.,[5] *Orthotylus flavosparsus* Sahlberg,[2] *Plagiognathus politus* Uhler,[6] *Pœciloscytus basalis* Reuter,[2] *Scolytus rugulosus* Ratzeburg.[7]

Notwithstanding the fact that it is thus clearly demonstrated that insects can transfer this bacillus, the question yet remains as to how important they actually are in spreading this disease. While they can evidently transfer the disease are they chief or even important agents in its transfer? In order to make tests bearing on this question two pear trees about four meters high were enclosed last year in wooden frames measuring four meters square on the ground and four meters high. These structures were covered with 14-mesh wire mosquito netting. The intention was to

[1] Waite, M. B., report in Smith, Erwin F., "Bacteria in Relation to Plant Diseases," 2: 55.

[2] Stewart, V. B., and Leonard, M. D., *Phytopathology,* 5: 117–123.

[3] Burrill, A. C., *Phytopathology,* 5: 343–347.

[4] Stewart, V. B., N. Y. (Cornell) Agr. Exp. Sta. Bull. 329.

[5] Stewart, V. B., *Phytopathology,* 3: 273–276.

[6] Stewart, V. B., and Leonard, M. D., *Phytopathology,* 6: 152–158.

[7] Jones, D. H., Ontario Agr. College Bull. 176.

determine whether infection was as abundant under such a cover as in the open. Infection was fully as abundant. Conclusions could not be satisfactorily drawn, however, because it was found that the mesh of screen used was large enough under the conditions to allow the entrance of a large number of very small insects. The conditions of the experiment were, therefore, revised this year with the hope of making them crucial. Twelve-mesh wire screen cylinders, 15 cm. in diameter and 30 cm. long, were constructed to enclose parts of single branches. To prevent contact with the branches to be enclosed, cords were run four times transversely through each cylinder. Some of the cylinders were slipped into closely fitting sleeves of fine bolting cloth (124 threads per linear inch). For durability, the bolting cloth was sewed into canvas which formed the ends of the sleeves, covering the rough ends of the wire, and extending past the wire about 14 cm., sufficiently to permit secure tying. The ends of other cylinders were similarly covered with canvas and the exposed part of the wire was painted with a mixture of tangle-foot and benzene. The cylinders were slipped over branches including either last year's terminal shoots or bearing wood. In the former case the cylinders were extended far enough past the ends of the branches to allow for this year's terminal growth. All this was done before any of the blossoms opened, at the beginning of the pink-bud stage. The cylinders treated with tangle-foot were repainted frequently enough to maintain a sticky surface. No insects and no traces of them of any sort were found in any of the cages with one exception.[8]

There were ten cylinders enclosing flowering wood. Flowers in two of these cages blighted, as was shown by their appearance and as was verified by microscopic examination. The blight evidently entered through the calyx. Blossom blight was not abundant this season in this orchard.

Forty cylinders, twenty of the bolting cloth and twenty of the tangle-foot type, were used to include terminal growth. Of this year's shoots four in the bolting cloth cylinders and eight in the tangle-foot cylinders blighted, a total of twelve in forty, or thirty per cent. This was practically the same proportion of blighted terminal shoots as prevailed among the unenclosed shoots, as was shown by a count of a thousand terminal shoots on these and adjacent trees of the same variety and age.

From the above facts it appears that there must have been some agency of dispersal other than insects, and that insects were not even of primary importance as carriers. The only tenable hypothesis is that wind was the chief agent of transmission. Supporting evidence for this conclusion is found in two facts: (1) in the lack of insects in the orchard in sufficient numbers to account for the large amount of twig blight and (2) in the entire absence of insects from exuding cankers, whence they might receive their initial contamination. In three years' close observation at blooming time one of the authors (Ruth) has not observed a single case of insect visitation to exuding cankers. Aphids were entirely absent through the season of floral and twig infection. Leafhoppers became evident in rather small numbers only after the period of infection had passed. No other insects were present in sufficient numbers to be considered primary agents.

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[8] One cylinder was accidentally allowed to dry. Two insects were found in it. The shoot was not blighted.

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